Patent Application of

Bruce Bradford Thomas

For

TITLE: MODEL OPTIONS

CROSS-REFERENCE TO RELATED APPLICATIONS Not Applicable

FEDERALLY SPONSORED RESEARCH Not Applicable

SEQUENCE LISTING OR PROGRAM Not Applicable

BACKGROUND OF THE INVENTION--FIELD OF INVENTION

This invention relates to options where the underlying may be a financial asset, a commodity, or some other type of real or personal property.

BACKGROUND OF THE INVENTION

Options

Option contracts give the holder a right to buy or sell property at a specified price, called the strike or exercise price, within a given period of time for an agreed upon sum. The

payment that is exchanged for this right is called the option premium. If the option holder does not exercise his right within the given period of time, the option expires worthless.

Having the right but not the obligation to buy or sell property at some prespecified price is valuable. This is why option buyers are willing to pay option sellers a premium for this right. Since options derive their value from the price of the underlying assets they are considered derivatives.

The Value of an Option

An option's value can be thought of as having two primary components. The intrinsic value is the value that an investor would get if she immediately exercised the option. This is the difference between the current price and the exercise price and is also described as "moneyness." If the option has a positive intrinsic value, meaning that the exercise price is less than the current price of the asset, it is said to be "in-the-money." Thus, deep in-the-money options refer to options that have strike prices substantially below the underlying asset price and deep out-of-the-money options refer to options that have strike prices substantially above the underlying asset price.

The second component of an option's value results from how likely and in what direction the intrinsic value of the option is expected to change over the life of option. This is a function of the underlying asset's propensity to change in value and the remaining life of an option.

Although many options expire without value, most options that are in-the-money are bought or sold, rather than exercised. This is because exercising an option early forfeits the remaining time value of the option. Also, exercising an option and converting it into the underlying property destroys the financial leverage that options enable.

Financial Leverage

Options are beneficial because they allow the holder to gain financial leverage by buying just the portion of the underlying property that the holder believes is desirable. For example, a speculator who believes that a particular stock will rise to $60 within the next

three months from its current price of $50 has a choice of buying the underlying stock or options on the stock.

Assuming that the speculator has $5,000 to invest and a three-month option to buy one share at a strike price of $50 cost $3.58, the speculator can buy either 100 shares of the stock or purchase 1,396 options to buy the stock. The options are significantly cheaper than the stock because they are only valuable if the stock price increases above $50 per share during the next three months.

If the speculator is correct and the stock price increases to $60, she will make $1,000 if she purchases the stock. She will make $8,962 if she purchases the options ($60 - $50 = $10 per share increase times $1,396 options = $13,960 less the option premium of $4,998). Thus, it can be seen that it is much more efficient for the speculator to buy options than to buy the underlying stock.

Option Usage

Exchanges facilitate the trading of options on stock, commodities, currencies, and debt instruments. An exchange can be a physical location or an electronic mechanism where trading takes place. Although options can be traded directly between two individuals or companies, this rarely happens in practice. This is because exchanges assist in the price discovery process and provide a valuable role in minimizing credit risk.

Options are used in many different ways. Speculators use options to bet on the underlying property increasing or decreasing in value over some specified period of time. Assuming a speculator believes that the underlying property's price will decrease, she may purchase a put option, giving her the right to sell that property to the option seller at a pre-specified price. Conversely, if she believes that the price will increase, she may desire to purchase a call option that will give her the right to buy the property from the option seller at a pre-specified price.

Many investors use options to hedge or offset the risk of some component of their portfolio. For example, a stockholder who is concerned that stock prices may fall dramatically might buy put options and sell call options to limit the potential loss of value.

Similarly, manufacturers may desire to hedge price increases or decreases associated with their raw material inventories.

Stock Option Types

There are three basic types of stock options. American style stock options enable the holder to exercise the option at any point prior to the expiration date. European style stock options only enable the holder to exercise the option on the expiration date. Burmudian stock options may be exercised at any one of various pre-set points during the life of the option.

Incentive Stock Options

Another type of option in widespread use is the incentive stock option. Incentive stock options are granted to corporate managers and employees as a means of motivating them to achieve certain financial and operational objectives. These options are usually granted at a strike price that is at or above the price of the underlying stock on the grant date and these options often vest over a period of future employment such as three or four years. In addition, incentive stock options usually have much longer terms than exchange traded stock options.

There has been significant controversy in recent years over the use of incentive stock options. While part of the debate is focused on the suspicion that corporate executives are too highly compensated, this concern is fuelled by disputes over option valuation and how best to show this compensation in the books and records. From an accounting perspective the issues are about how best to show the dilutive effects of such options and whether to show them as an expense, which then gets into questions of how to measure the expense and how best to show the expense in the financial statements. The Financial Accounting Standards Board issued Statements of Financial Standards No. 123 and No. 148 to resolve the accounting treatment of incentive stock options.

Nevertheless, the fair value approach that the new standards require is still controversial. Since there is no publicly traded market for these options, it is impossible to use the market

as a means to determine how these options should be valued. Additionally, many people disagree about whether the current option pricing models produce meaningful valuations of long-duration option contracts.

As a result, some companies have discontinued the use of incentive stock options and are now granting stock and restricted stock to their employees instead. While it is certainly easier to measure the cost of a share of restricted stock than a stock option, this change gives-up the benefit of financial leverage that characterizes options and motivates employees to achieve specific objectives. Thus, instead of giving an employee options so that she only benefits if the stock price increases above a certain level, the company may now give her the entire share value so as to avoid complex valuation issues.

Option Pricing Models

A number of mathematical models have been developed to determine the theoretical value of an option. The first of these models to achieve widespread acceptance was the Black and Scholes Option Pricing Model which was introduced in 1973. This model is predicated upon the following assumptions: the stock pays no dividends; European exercise terms are used; markets are efficient; no commissions are charged; interest rates are known and constant; and returns are lognormally distributed. Since each of these assumptions can be debated, this model has been modified overtime and other models have been developed to correct certain perceived weaknesses of the Black and Scholes Model.

For example, the Binomial Model breaks down the time to the expiration of an option into discrete intervals. At each interval, the stock is assumed to increase or decrease by a certain amount based on its volatility and time to expiration. In effect, this produces a tree of potential stock prices over the life of the option with each branch representing a possible path that the stock price could take during the remaining life of the option. Probabilities are then applied to each path to produce the expected value of the option.

Although a number of option price models have been developed since the Black and Scholes Model, this Model is still widely used due to the fact that it can be calculated faster

than some of the newer models that require iterative calculations. Calculation speed is essential in a market where option prices can change very quickly.

Despite the different techniques that they employ, the models require essentially the same inputs to create an option's theoretical value. These inputs are: the current stock price, the exercise price, the time to expiration, the risk-free interest rate, the dividend rate, and the volatility of the underlying stock.

Uncertain Option Values

Despite new and improved option pricing models, there is still significant uncertainty about what the value of an option is. This uncertainty is resident before the contract is entered into and extends until the date the contract expires, at which point the theoretical value and the market value converge.

Actual option prices may vary significantly from the theoretical values of the option pricing models due to a lack of liquidity. Thin trading may impede price discovery and allow for greater pricing imperfections. This may cause significant pricing distortions on options that do not trade very much such as options on smaller companies, option contracts with expiration dates greater than one year, and deep in or out-of-the-money contracts.

However there are significant differences between the model values and the market values even when options are heavily traded. Proponents of option pricing models naturally assume that these differences are caused by different market participants using different assumptions about the inputs to those models.

Since the current stock price, the exercise price, and the time to expiration are fixed, these parameters are not subject to dispute. While the risk-free interest rate and the dividend rate may change, these values do not generally change enough over short-periods of time to cause big changes in option values.

Thus, the parameter most in dispute is the volatility of the underlying stock. Historical volatility can vary significantly based on how the calculation is done and by how many days of historic price changes are used to derive this number.

Implied Volatility

One can take the current market value of an option and the other less contentious model inputs described above and substitute volatilities into the model until it produces a theoretical value that is equal to the market value of the option. This number is called "implied volatility." In essence, implied volatility is how market participants reconcile actual option prices with the theoretical values derived from the models they use.

One way to describe the difference between historical volatility and implied volatility is to say that market participants think the historical experience of a stock's price changes were abnormal. In effect, they think that the historical experience was more or less volatile than what will happen over the future life of the option.

For those participants who believe that their chosen option pricing model adequately describes the value of an option, implied volatility may be useful for reconciling the model with the market. However, this number is not very meaningful for deep in or out-of-the-money options, where extraordinary amounts of volatility are required to change the option value by relatively small amounts of money.

New Approach Needed

Given how useful they can be, options are not employed nearly as much as they should be. There are several fundamental reasons why options are not used more.

First, option calculations are relatively complicated and difficult for the average investor to understand. The learning curve is steep for most investors, and the details of option usage are difficult to explain to the uninitiated. This lack of understanding makes many investors uncomfortable with using options.

Second, since most options are traded on exchanges, option prices are subject to market distortions which may prevent even the most astute observers from being able to use them effectively. While there is significant trading of stock options at or near-the-money for the largest companies, there may be little or no trading of deep out-of-the-money options on those stocks. Moreover, there is not much liquidity for options that extend beyond one year or for options on the stocks of smaller companies either.

Third, although theoretical models of option valuation may help provide some insight into the pricing of options, they are also problematic. There are now many models to chose from, each with some subtle difference, each meant to address some theoretical problem. Despite all of the advances, there are still significant differences between the model prices and the market prices of options. Such differences are confusing to investors. Either the models are wrong or the market is wrong, but how is the investor to know which is right?

Forth, since there is not much of a market for long-duration options such as incentive stock options, one cannot compare the model valuations to the market valuations for such options. Thus, one cannot even demonstrate that the models work as well in such situations as they do on contracts with lesser expiration dates. This is problematic given that current accounting treatment requires companies to ascribe a fair value to incentive stock options.

Fifth, the trading cost of using options can impair the use of deep out-of-the-money options. This is because the expense of trading such options gets too large in relation to the expected value of such options.

Ultimately option usage is curtailed because people do not understand how they work and they are suspicious that the price of options may be incorrect, regardless of whether it is derived from an option pricing models or the market. In effect, the degree of moneyness, company size characteristics, and near-term expiration dates all limit the potential size of the options market and in turn limit its usefulness to investors.

Option pricing must be better understood by market participants. There must be a way of valuing options with greater certainty.

BACKGROUND OF INVENTION-OBJECTS AND ADVANTAGES

The object of the invention is a method that enables companies and individuals to employ the financial leverage and theoretical characteristics of options without being bound by the limitations and imperfections of the traditional option market. Model options objectify the uncertainty associated with the pricing of options using an agreed value approach.

Model Options help expand the usefulness of options by enabling participants to easily understand the components of option valuation and to provide ready and continuous access to option pricing, even when there is no active options market. With Model Options, debates about marking-to-model and marking-to-market disappear.

In the case of incentive stock options, companies and employees can make use of the financial leverage associated with options without having to worry about whether the option pricing model they use is accurate. With Model Options, the model accurately specifies the value of an option because it is the value of that option.

With Model Options, buyers and sellers no longer need to be wary of long-duration, or deep in-the-money or deep out-of-the-money options. They can confidently employ options to help them gain financial leverage because they can be confidant that thin markets and poor liquidity will not distort prices.

Since price discovery is not necessary for Model Options, buyers and sellers can trade without the need for a traditional market such as an exchange. By alleviating the need for options to be traded on an exchange, option usage can be significantly expanded and trading costs can be reduced. This is especially true for deep out-of-the-money options where the expected value of such options may be less than the transaction fees. The current market-based approach to option pricing discourages trading of such options because the fees are static and participants end up paying trading cost that are too large in relation to what the underlying options are worth to be economical.

Model Options enable options to be traded on small company stocks. Currently, options exchanges are not interested in such trading because it does not represent a significant amount of transaction volume, and the cost of such activity is not worth their trouble. Conversely, market participants generally steer away from such trading due to fears of pricing distortions and the potential for manipulation.

Model Options can be priced continuously, enabling interim settlements of value. This is a helpful means of reducing counter-party credit risk. For example, buyers and sellers could agree that they will make interim payments to one another for increases and decreases in the value of an option once that option has a positive intrinsic value.

Unlike traditional Options, Model Options can be structured so that they never permit the holder to exercise the option. Instead of forcing the holder to pay the exercise price to receive the underlying asset, the parties can structure a Model Option so that the holder can receive its value at expiration. This reduces transaction costs and may be especially useful when the option holder has no interest in converting the option into the underlying.

Another useful feature of Model Options is that each of the component parts of option valuation is specifically identified. This characteristic makes it possible for option participants to trade each of the underlying components of an option separately. For example, option buyers and sellers could agree to trade just the volatility component of an option.

Model Options may be applied to any type of option regardless of whether the underlying is a financial asset, a commodity, or an item or collection of real or personal property.

Further objects and advantages are to increase the use of options by making their values more understandable and more reliable and by making them more cost-effective to trade. Other objects and advantages will become apparent from a consideration of the ensuing description and drawings.

SUMMARY

This method permits a buyer and seller to exchange the financial characteristics of an option by agreeing on the characteristics of that option and a methodology that will be used for valuing that option. In essence, a Model Option is an option contract that specifies a formula that will be used to determine its value.

Instead of relying on the market to generate the appropriate value for an option, Model Options specify how an option will be valued by describing a calculation methodology and how each of the inputs to that calculation will be derived. In addition to describing an underlying asset, a strike price, an expiration date, and the type of exercise that is allowed (American, European, etc.), Model Options specify a particular option pricing model (such as the Black and Scholes, the binomial, etc.) and how each of its inputs will be calculated

(i.e., the risk-free rate of interest, the historical volatility of the underlying assets price, the dividend rate, etc.).

This "agreed value" approach to option valuation may be used to determine the initial price of the option, the value of an option at any point during the term of the contract, and the value at the expiration of the contract. Thus, Model Options can be used in conjunction with the present market-based model of option pricing in many different ways.

DRAWINGS--FIGURES

Fig 1 shows how a buyer and seller might use this method to enter into a Model Option contract that will enable them to determine the value of the option at any point from contract inception to expiration.

DETAILED DESCRIPTION--FIGS 1 --PREFERRED EMBODIMENT

An overview of how a buyer and seller might use this method to enter into a Model Option contract is shown in Fig 1. To enter into a Model Option contract, a buyer and seller must agree on the basic terms of that option **1** and must agree on a methodology that they will use to value the option **3.** If they can agree on these terms then the buyer will pay the seller an option premium as specified by their contract **4.** If they are unable to agree on the basic option terms and the valuation methodology, they will not enter into a Model Option contract **2.**

Operation of the Invention

The basic option terms that buyers and sellers must agree to **1** are a standard part of any option. They include such things as what the underlying asset consists of, the quantity of the underlying asset to which the options relate, the strike price, the expiration date, and the ability to exercise the option.

In order to enter into a Model Option, the buyer and the seller must also agree on a formula that will be used to calculate the value of the option **3**. Black and Scholes,

Whaley, Binomial Lattice, Trinomial Trees, and Merton's Jump Diffusion are examples of some of the models that might be used to calculate the value of a Model Option. The buyer and seller must also agree on either a specific value or a formula that will be used to determine the remaining inputs that are necessary for the model they have agreed to use.

Assuming for example that the underlying asset is a stock and the parties have agreed to use the Black and Scholes Model, they also need to agree on what values they will use for the risk-free rate, the dividend rate, and the stock's price volatility. They could agree to use fixed values for each of these inputs or to agree on a formula that will determine these values. Thus, they may agree to use the 90-day US Treasury bill yield as the risk-free rate, the last dividend payment annualized as a percentage of the current stock price as the dividend rate, and the annualized standard deviation of the daily change in the underlying stock's price over the preceding 30 trading days as the volatility.

Next the buyer and seller must agree on when the formula that they have specified will be used to determine valuation. They can use it to determine the option premium at contract inception, at each important point between inception and expiration, and at expiration. They may agree to use the model to determine valuation during the entire life of the option. Alternatively, they may decide to use the model to determine the option's value only after inception. This approach might make sense in the case of employee stock options, where vesting takes place over a period of years. Additionally, they may agree to exchange money at various points over the life of the option in accordance with changes in the value of the contract so that the contract never needs to be traded or exercised and that credit risk may be minimized.

Additional Embodiments

Although the basic methodology for Model Options is described above, there are numerous embodiments of this concept. This method can be applied to all types of options on all types of assets.

This method can be used both on and off of an options exchange. In the case of exchange usage, the specifications of each contract would be predetermined by the

exchange and the buyer and seller would merely agree to trade a particular contract. This eliminates the need for a buyer and seller to agree on each term individually.

Furthermore, this methodology can be used in conjunction with any other type of option pricing mechanisms at various points of the options life.

Conclusion, Ramifications, and Scope of Invention

From the description above it should be clear that this method of option valuation satisfies many purposes that can not be accomplished via traditional options. Incorporating a specific valuation methodology into an option contract makes option valuation more understandable, more certain, and less costly. Model Options help expand option usage by permitting buyers and sellers to use options in ways that are currently impossible.

Model Options eliminate the need for the price discovery function of an exchange. This enables trading on small company stocks, on long-duration options, and on deep out- of-the-money options that is not possible presently due to a lack of liquidity, and concerns about the potential for pricing distortions and manipulation.

Model Options eliminate the importance of small speculators to the price discovery process. This, in turn, lessens the importance of the credit risk management function that large exchanges provide. Absent the need for a price discovery function and a credit risk management function, it is possible for smaller exchanges consisting of large credit-worthy participants to trade Model Options with much lower transaction costs.

Model Options permit the buyer and seller to agree that the contract will never be exercised and that the buyer will never force delivery of the underlying asset. This prevents unnecessary trading since the buyer can receive value without having to exercise the option or make an offsetting trade to close out a given trading position.

By reducing transaction costs, it becomes feasible for large institutions to buy and sell deep out-of-the-money Model Options that have very small expected values. Currently, such trading is infeasible because, at a certain point, the cost of trading exceeds the expected value of the options.

By using Model Options to compensate employees for achieving specific operational or financial targets, companies and employees can gain the benefits of financial leverage while gaining certainty over the expense and the value associated with these options.

By agreeing to a specific formula for determining an option's value, investors can use Model Options to create more precise hedges.

Using Model Options, investors can disaggregate each of the component values of an option's price and trade each of these values separately. This is impossible with traditional options.

Although the description above contains certain specifics, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention. This methodology can be applied in many ways to all types of options, on all types of assets and can be used on options that are traded on exchanges or between two parties directly. Thus the scope of the invention should be determined by the appended claims and the legal equivalents, rather than by any particular example described above.